REMARKS

Applicant has carefully reviewed the Examiner's January 29, 2004, Official Action and respectfully requests reconsideration based on the above amendments and the following comments.

Claims 1-24 have been canceled, and new claims 25-31 added.

Applicant respectfully submits that the finality of the Examiner's January 29, 2004 Action is not justified, as the Examiner had not acted on claims 18-24 on their merits and is limited only to a prior art rejection of claim 17. MPEP 706.07(b) clearly provides for a first action final rejection only where "all claims of the new application are drawn to the same invention claimed in the earlier application." The Examiner clearly did not make such a determination in her January 29, 2004 action. Accordingly, Applicant respectfully requests that the finality of the January 29, 2004 action be withdrawn.

The Examiner has rejected claim 17 under 35 U.S.C. 102(b) as being anticipated by Scheibel '475. Applicant respectfully traverses this rejection especially as applied to new claims 25-31.

As the Examiner will note, new independent claim 25 clearly establishes that the heat medium circulates in the jacket around the periphery of the cylindrical tube ~~is~~ without entry of the heat medium into the tube, and further, that the upper end side of said tube communicates through a duct with a vacuum exhaust system. These two structural features are not disclosed at all in Scheibel and define, in part, the unique manner in which the claimed apparatus functions differently than Scheibel.

The following comparison of the operation and structure of Scheibel and the claimed invention more specifically identifies these differences.

USP 3,396,475(SCHEIBEL)

(A)

(1) Liquid material feed to be introduced through spray line 26 is sprayed into spray chamber 24 by means of spray nozzle.

(2) Within the spray chamber 24, there flows expansion gas which has been cooled. The cooled gas circulates in the sequence of line 25→ exchanger 14→ line 37→ heat-exchanger 18→ back to spray chamber 24. (See Column 3, lines 3-5, wherein it is indicated that "expanded cold air is passed into heat exchange 18",

and lines 7-9, which indicate that "heat exchanger 18 is constructed so that the cold air passes... in counter-direct contact with the freeze dried solids.") The liquid material feed as sprayed comes into contact with this expansion gas to be subjected to freeze-drying, and the material as frozen is broken into pieces, which drop into the heat-exchanger 18 connected below the spray chamber 24, and collected into the bottom part of the heat-exchanger 18.

(3) Individual pieces of the material as freeze-dried, which are collected in the heat-exchanger 18 is taken out of the outlet 19 in the bottom part of the heat-exchanger, and collected into the collection chamber 21.

(4) Both the water vapor produced and the liquid material feed as sprayed within the spray chamber 24 is subjected to the freeze-drying by means of cooled gas, and water vapor which is sublimated from the pieces of the liquid material feed as freeze-dried are guided by the line 35 connected to the lines 25, 37, in which the cooled gas circulate, through a branched tube, to the sections 50, 51 surrounding the outer periphery of the heat-exchanger 18, and take a

form of ice to adhere and accumulate over the fins on the outer peripheral surface of the heat-exchanger 18.

(5) The ice, which is guided into the sections 50, 51 to be adhered and accumulated over the fins on the outer peripheral surface of the heat-exchanger 18, when it fills up in the sections 50, 51, is melted by feeding hot compressed gas, and collected into settler 22 in the form of liquid.

(B)

The heat exchanger 18 is shaped in the upright cylindrical form. The inner cavity side of this heat exchanger in its upright cylindrical form constitutes a cooling air duct which functions to blow up expansion gas as cooled toward the spray chamber 24 where the liquid material feed is sprayed through the spray nozzle. This upright cylindrical form also constitutes a guide passage for guiding the dropped liquid material feed, which has been spray-dried and solidified within the spray chamber 24.

Both water vapor produced from the liquid material feed when the outer surface side of the heat exchanger performs spray drying of the liquid material feed within the spray chamber, and water vapor which is sublimated from the liquid material feed which has become spray-dried and solidified, are

guided by the cooled and circulating expansion gas, followed by turning the same into cold-trap for condensation and collection as ice flakes.

THE CLAIMED INVENTION (10/035,421)

(A)

(1) Material for drying in liquid form is ejected from inlet port 50 on pipeline 5 disposed in the duct 3 to blow the liquid material, on the upper end side of the inner wall surface 1a of the upright cylindrical tube 1, against the inner surface of the extension wall 1b projecting upward from the liquid surface of the heat medium in the Jacket 2 which surrounds the tube 1.

(2) The liquid material for drying as ejected moves along the inner surface of the extended wall 1b to flow on the area, of the inner wall surface 1a of the tube 1, and flows down along the inner wall surface 1a. At a position where the outer peripheral side of the tube 2 comes into contact with the liquid heat medium within the jacket 2, the liquid material turns into frozen state, while it is flowing down along the inner wall surface 1a. By repeating the flow-down action of the liquid material on and along the inner

wall surface 1a, the frozen layer of the liquid material feed develops in a cylindrical shape on the inner wall surface 1a of the tube 1.

(3) When the frozen layer of the liquid material feed, which develops in a cylindrical shape on the inner wall surface 1a of the tube 1, reaches a predetermined thickness, supply of the liquid material is stopped, and the un-frozen liquid material in the tube 1 is taken out to terminate the freezing step of the liquid material feed. This freezing step is effected under the atmospheric pressure, by closing the valve 30 to intercept the inner cavity of the tube 1 from the vacuum exhaust system.

(4) As soon as the freezing step is terminated, the valve 30 is opened to connect the inner cavity of the tube 1 with the vacuum exhaust system (which is present in Scheibel), and then the water vapor to be sublimated from the moisture content in the liquid material feed as frozen is captured by the vacuum pump VP and the cold trap CT, thereby desiccating the liquid material.

Since this desiccating step uniformly sublimate the moisture content in the liquid material feed from the upper part to the lower part, as a whole, of the liquid material, with the inner surface of the center hole in the tube 1 as the sublimating surface of the water vapor, the frozen layer of the entire liquid material in the cylindrical form can be uniformly desiccated, while keeping its cylindrical shape. (The frozen layer is not found in Scheibel as its heat medium enters the tube on its way to chamber 24 precluding formation os such layers.)

(5) When this desiccating step is terminated, the valve 30 is closed to cause the moisture within the material to sublimate in the tube to thereby drop the desiccated material in the hollow cylindrical form at its core part into the recovery chamber 4 by removing the supporting member 7 which has held the lower edge, or by blowing pressurized air into the tube 1. After this, the dropped material is crushed and the product is collected into the recovery tank t1.

(B)

The upright cylindrical tube 1 according to the claimed invention (U.S. Application No. 10/035,421) has the following function:

(a) it functions as the freezing chamber, in the freezing step, at which the liquid material is frozen, the liquid material on the inner wall surface of the tube is frozen in a hollow cylindrical shape by the cooling action of the liquid heat medium in the jacket surrounding the outer periphery of the tube which does not enter into the tube, while keeping the frozen material within the tube; and,

(b) its functions as the desiccating chamber, in the desiccating step, at which the moisture content in the liquid material feed, as frozen in the cylindrical shape, due to its connection with the vacuum exhaust system, changes over to the desiccating chamber to sublimate moisture content from the liquid material frozen in the cylindrical shape, and desiccate the same.

From the foregoing comparison of the claimed invention and the cited patent to Scheibel, it is clear that the heat exchanger 18 of the cited reference patent is structurally different from the upright cylindrical tube 1 according to the claimed invention in its technical contents and functional result.

The prior art documents made of record and not relied upon have been noted along with the implication that such documents are deemed by the PTO to be insufficiently pertinent to warrant their applications against any of applicant's claims.

Favorable reconsideration and allowance are earnestly solicited.

Respectfully submitted,
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